

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography	
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto						Ref. Numb	Abstract?
100 Areas	100		8 with 100 and 300 MHz antenna										varied, from locating cribs, trenches and septic systems to helping site boreholes		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
100 Areas	100		X	X									location and the associated document number for investigations that have		WHC-SD-EN-TI-247	Mitchell, TH	#####	90	Yes.
Columbia River Effluent Pipelines for 100 Area Reactors (116-B-7, 132-B-6, 132-C-2, 116-D-5, 115-DR-5, 116-F-8, 116-H-5, 116-K-3, 1908-N)	100	4-11 thru 4-17-94	GSSI SIR 8 with 100 MHz antenna										Other methods: EG&G Side-scan Sonar, Datasonics 5000 subbottom profile (3.5 kHz), Datasonics 1200 bubble pulser seismic reflection (500 Hz)			Westinghouse Hanford Company (WHC)			No.
116-B-1	100-B	2-27-92	8 with 300 MHz antenna										determine whether proposed borehole site is located within the crib		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-B-10 Dry Well	100-B	10-18-93	8 with 300 MHz antenna										locate the Dry Well	0-14	WHC-SD-EN-TI-213	Bergstrom, KA and JW Fassett	1994	29	Yes.
116-B-10 Dry Well	100-B		10A with 500 MHz antenna										locate the Dry Well	0-14	ERC IOM # 039007	Mitchell, TH and KA Bergstrom	1996	NA	NA
Basin, 116-B-1 Liquid Waste Disposal Trench, and 116-B-13	100-B		GSSI SIR ?										trench and any anomolous debris. Locate and map walls and pipelines associated		BHI-00717	Bergstrom KA and TH Mitchell	Feb-96	37	Yes.
116-B-12 Crib	100-B		10A with 300 MHz antenna										confirm location and map boundaries	0-13	None (1)	Mitchell, TH and KA Bergstrom	1998	NA	NA
116-B-16 Fuel Examination Tank	100-B		10A with 300 MHz antenna										confirm location and map boundaries	0-14	None (1)	Bergstrom, KA, and TH Mitchell	1998	NA	NA
116-B-2 Fuel Storage Basin Trench	100-B		8 with 300 MHz antenna										locate and map trench	0-12	ERC IOM # 039006	Bergstrom, KA, and TH Mitchell	1992	NA	NA
116-B-2 Fuel Storage Basin Trench	100-B		10A with 300 MHz antenna										locate and map trench	0-12	ERC IOM # 039007	Bergstrom, KA, and TH Mitchell	1996	NA	NA
116-B-3 Pluto Crib	100-B		8 with 300 & 500 MHz										confirm location and map boundaries	14-16	BHI-00344	Mitchell, TH and KA Bergstrom	Jul-95	93	No
116-B-4 French Drain	100-B		8 with 300 & 500 MHz										confirm location and map boundaries	14-16	BHI-00344	Mitchell, TH and KA Bergstrom	Jul-95	93	No

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Dept h (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR GSSI SIR	EM	IP	Downhole Acoustic	Seismic (Acousti)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstrac t?	
116-B-5	100-B	2-21-92	8 with 300 MHz antenna											boundaries. If possible determine if any areas had caved in.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-B-6-1 Crib	100-B		X GSSI SIR											TSV site. Locate crib, determine size and configuration. Detect	20 ft	PNL Memo to S.J. Mitchell	G.A. Sandness	#####	NA	NA
116-B-6A Crib	100-B		10A with 300 MHz antenna											confirm location and map boundaries		ERC IOM #039006	Mitchell, TH and KA Bergstrom	1998	NA	NA
116-B-6B Crib	100-B		10A with 500 MHz antenna											confirm location and map boundaries		ERC IOM #039006	Mitchell, TH and KA Bergstrom	1996	NA	NA
116-B-6B Crib	100-B		10A with 300 MHz antenna											confirm location and map boundaries		ERC IOM #039007	Mitchell, TH and KA Bergstrom	1998	NA	NA
116-B-9 French Drain	100-B	10-18-93	8 with 300 MHz antenna											locate the French Drain		WHC-SD-EN-TI-213	and JW Fassett	1994	29	Yes.
116-B-9 French Drain	100-B		10A with 500 MHz antenna											locate the French Drain		ERC IOM #039006	Mitchell, TH and KA Bergstrom	1996	NA	NA
118-B-1	100-B	4-6-93	GSSI SIR 8 with 300 MHz antenna	Geonics EM-31D								X		Map the concentrations of waste and aid in the selection of test pit excavation locations	10-12 TL-138 (4)	WHC-SD-EN-TI-137 (1). DOE/RL-95-34 (2). WHC-SD-EN-DP-066 (3.) WHC-SD-EN-DOE. 3) Berstrom and	1) Bergstrom, KA; TH Mitchell and AL Langstaff. 2) DOE. 3) Berstrom and	1) Oct-93 2) Aug-95. 3) Feb-1994. 4) 19	1) 17. 2) 117. 3) 22. 4) 19	1) No. 2) Yes. 3) no. 4) no
130-B-1	100-B		X GSSI SIR									X		Locate and map underground fuel storage tanks, pipes,	15 ft	PNL letter report to Ron Shuck, WHO	G.A. Sandness	#####	NA	NA
199-B2-12	100-B	2-6-92	8 with 100 MHz antenna											locate utilities and buried debris that may effect drilling of borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-B4-9 and 116-B-2	100-B	3-5-92	8 with 300 MHz antenna											buried debris that may effect drilling of borehole B4-9 and locate 116-B-2		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-B5-2	100-B	3-11/12-92	8 with 300 MHz antenna											locate utilities and buried debris that may effect drilling of borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-B9-2	100-B	2-28-92	8 with 300 MHz antenna											locate utilities and buried debris that may effect drilling of borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-C-2A Pluto Crib	100-C	5-14-93	8 with 200 MHz antenna											map crib boundaries and locate sampling borehole 199-B9-4		WHC-SD-EN-TI-154	Mitchell, and Kiesler	Jul-93	15	No.
116-C-2B Pluto Crib Pump Station	100-C		10A with 300 MHz antenna	Geonics EM-31										and utilities and unknown buried structures		None (1)	Mitchell, TH and KA Bergstrom	1998	NA	NA
116-C-2C Pluto Crib Sand Filter	100-C		10A with 300 MHz antenna	Geonics EM-32										and utilities and unknown buried structures		None (1)	Mitchell, TH and KA Bergstrom	1998	NA	NA

Review of Geophysical Characterization Methods

Appendix A - Catalog of Shallow Surface Geophysical Surveys

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstract?	
116-C-5 Retention Basin	100-C	?	?											perimeter of basins, and unknown features. Determine optimum		BHI-00716	Bergstrom, KA and TH Mitchell	Feb-96	38	Yes
118-C-1	100-C	8-93	GSSI SRI											burial ground		WHC-SD-EN-TI-067 (1). WHC-SD-EN-TI-247	1) Mitchell, TH and KA Bergstrom. 2)	94. 2) Sep-94	1) 85. 2) 90	1) No. 2) Yes
100-D-32 Burial Ground	100-D		10A with 200 MHz antenna	Geonics EM-31D										map western effluent line and other subsurface features		None (1)	Mitchell, TH and KA Bergstrom	1999	NA	NA
100-D-6 Burial Ground	100-D		10A with 200 MHz antenna	Geonics EM-31D										map western effluent line and other subsurface features		None (1)	Mitchell, TH and KA Bergstrom	1999	NA	NA
107-D-1 Sludge trench	100-D		GSSI SRI System 10A with 200-MHz antenna	Geonics EM-31										Locate, map, and/or verify locations of subsurface pipelines, utilities, sludge disposal trenches, and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
107-D-2 Sludge trench	100-D		GSSI SRI System 10A with 200-MHz antenna	Geonics EM-31										Locate, map, and/or verify locations of subsurface pipelines, utilities, sludge disposal trenches, and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
107-D-3 Sludge trench	100-D		GSSI SRI System 10A with 200-MHz antenna	Geonics EM-31										Locate, map, and/or verify locations of subsurface pipelines, utilities, sludge disposal trenches, and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
107-D-4 Sludge trench	100-D		GSSI SRI System 10A with 200-MHz antenna	Geonics EM-31										Locate, map, and/or verify locations of subsurface pipelines, utilities, sludge disposal trenches, and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
107-D-5 Sludge trench	100-D		GSSI SRI System 10A with 200-MHz antenna	Geonics EM-31										Locate, map, and/or verify locations of subsurface pipelines, utilities, sludge disposal trenches, and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
108-D	100-D	5-1-92	8 with 300 MHz antenna											and pipelines associated with the former 108-D building		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-1A/1B	100-D	9-27-91, 10-1-91, 2-11-2	8 with 100 and 300 MHz antenna											Locate trench. Find debris free zone for emplacement of soil gas probes.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-1A/1B Liquid Disposal Trench	100-D		8 and 10A with 300 & 100 MHz											delineate utilities and subsurface features and trench boundary	14-16'	BHI-00396	Bergstrom, KA, and TH Mitchell	Jan-96	36	Yes

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography	
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto						Ref. Numb	Abstract
116-D-2 Pluto Crib	100-D	1-7-92	8 with 100 and 300 MHz antenna										borehole is located within suspected Pluto Crib. If not, locate the Pluto Crib.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-2 Pluto Crib	100-D		8 and 10A with 300 & 100 MHz antenna										subsurface features, locate and map septic system and piping, and locate crib.	14-16'	ERC IOM #039006	Mitchell, TH and KA Bergstrom	1996	NA	NA
116-D-3 French Drain	100-D	11-14-91	8 with 100 MHz antenna										map locations of utilities, pipes, and buildings that once located at the site.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-3 French Drain	100-D		8 and 10A with 300 & 100 MHz antenna										delineate area of french drain and associated piping	14-16'	ERC IOM #039006	Mitchell, TH and KA Bergstrom	1991, 1996	NA	NA
116-D-4	100-D	11-14-91	8 with 100 MHz antenna										trending pipe that could possibly lead into trench.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-4 French Drain	100-D		8 and 10A with 300 & 100 MHz antenna										delineate area of french drain and associated piping	14-16'	ERC IOM #039006	Mitchell, TH and KA Bergstrom	1991, 1996	NA	NA
116-D-5 Outfall	100-D	12-5-91	8 with 300 MHz antenna										buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-6 Cushion Corridor	100-D	1-30-92	8 with 100 MHz antenna										Locate cushion corridor.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-6 French Drain	100-D		8 with 300 MHz antenna										delineate area of french drain and associated piping	14-16'	ERC IOM #039006	Mitchell, TH and KA Bergstrom	1992, 1996	NA	NA
116-D-7 Retention Basin	100-D		System 10A with 200-MHz antenna	Geonics EM-31									verify locations of subsurface pipelines and utilities and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
116-D-8 Cask Storage Pad	100-D	12-17-93	8 with 300 MHz antenna										locate french drain associated with cask storage pad	10-14'	WHC-SD-EN-TI-224, IOM #039006	Mitchell, TH and KA Bergstrom	1994	NA	NA
116-D-9	100-D	11-21-91, 2-12-92	8 with 300 MHz antenna										Locate utilities and buried debris. Locate drilling site.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-D-9 Crib	100-D		8 and 10A with 300 MHz antenna										delineate area of crib and any underground piping	14-16'	ERC IOM #039006	Mitchell, TH and KA Bergstrom	1996	NA	NA
118-D-5 Ball 3X Burial Ground	100-D	12-29-93, 1-19-94	8 with 300 MHz antenna										locate trench	10-13 ft	WHC-SD-EN-TI-226	Mitchell, TH and KA Bergstrom	May-94	88	No

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography	
			GPR GSSI SRI	EM	IP	Downhole Acoustic	Seismic (Acousti)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto						Ref. Numb	Abstract t?
130-D-1	100-D	1-24-92	8 with 300 MHz antenna										buried debris. Locate excavation boundary for gas storage tank that		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
130-D-1	100-D		X									?	locate and map underground fuel storage tanks, pipes,	15 ft	PNL letter report to Ron Shuck, WHO	G.A. Sandness	#####	NA	NA
130-D-2	100-D		X									X	locate and map underground fuel storage tanks, pipes,	15 ft	PNL letter report to Mark Morton, WHO	G.A. Sandness	#####	NA	NA
132-D-3 Effluent Pumping Station	100-D	1-7-92, 2-12-92	8 with 100 MHz antenna										buried debris and site free of drilling obstructions.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
1607-D3 Septic System	100-D	12-17-93	8 with 300 MHz antenna										locate septic tank and drain field	10-15'	WHC-SD-EN-TI-227	Bergstrom, Mitchell, and Szwartz	Apr-94	25	No.
1607-D4 Septic System	100-D	1-28-92, 2-11-92	8 with 300 MHz antenna										locate sites for soil gas probes that are free of underground obstructions.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
1714-D Oil/Paint Storage and 1715-D Sovent Storage	100-D	5-27-92	8 with 300 MHz antenna										building and areas where solvents etc. may have been deposited		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
190-D Sodium Dichromate North Transfer Line	100-D		10A with 300 MHz antenna										line and identify all bends, encasements or other potential weak points.		ERC IOM #051508	Mitchell, TH and KA Bergstrom	1997	NA	NA
D5-14	100-D	1-3-92	8 with 100 MHz antenna										buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
D5-15	100-D	1-3-92	8 with 100 MHz antenna										buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
D5-17	100-D	1-3-92	8 with 100 MHz antenna										buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
Paint Shop	100-D	4-15-92, 5-5-92	GSSI SRI 8 with 300 MHz antenna										the paint solvent buildings and identify any excavations around the shop that may have	8-12'	WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
Salt Dissolving Badium	100-D	5-27-92	8 with 300 MHz antenna										Locate salt dissolving pit.	10-12'	WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
Dichromate Pipeline from Transfer Station	100-D		10A with 300 MHz antenna										locate pipeline and other utilities and structures.	9-12'	None (1)	Bergstrom, KA, and TH Mitchell	1999	NA	NA
Sodium Dichromate Transfer Station	100-D	6-16-93	8 with 300 MHz antenna										utilities, and underground structures related to transfer	10-15'	WHC-SD-EN-TI-178	Bergstrom, KA, and TH Mitchell	Oct-93	18	No.
TP&L Trailer Ground Rods	100-D		10A with 300 MHz antenna										map utilities, pipelines, and other subsurface features		None (1)	Mitchell, TH and KA Bergstrom	1998	NA	NA

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR GSSI SIR	EM	IP	Downhole Acoustic	Seismic (Acousti)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstract	
116-DR-1 / 116-DR-2	100-DR	10-25-91	8 with 100 MHz antenna											Locate two sites for proposed boreholes free of buried obstructions		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-DR-1 Liquid Effluent Trench	100-DR		GSSI SIR System 10A with 200-MHz antenna	Geonics EM-31										Map the extent of liquid disposal trenches and locate and accurately map any unknown features (e.g., major)		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
116-DR-2 Liquid Effluent Trench	100-DR		GSSI SIR System 10A with 200-MHz antenna	Geonics EM-31										Map the extent of liquid disposal trenches and locate and accurately map any unknown features (e.g., major)		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
116-DR-3 Storage Basin	100-DR	93, 6-28-93, 8-17-93	8 with 300 MHz antenna											locate boundaries	12-14'	WHC-SD-EN-TI-177	Mitchell, TH and KA Bergstrom	Nov-93	81	No.
116-DR-4 Pluto Crib	100-DR	6-16-93	GSSI SIR											verify the location of the 105-DR Pluto Crib, 116-DR	12-14'	WHC-SD-EN-TI-195	Bergstrom, KA; and TH Mitchell	1993	20	Yes
116-DR-5 Outfall	100-DR	12-5-91	8 with 300 MHz antenna											locate utilities and buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-DR-6 Liquid Waste Disposal Trench	100-DR	12-15-93, 1-19-94	8 with 300 MHz antenna											locate the 116-DR-6 trench	10-15'	WHC-SD-EN-TI-222	Bergstrom KA	Aug-96	41	Yes.
116-DR-7 Inkwell Crib	100-DR	1996	10A with 500 MHz antenna											verify location of crib		ERC IOM #039006	Mitchell, TH and KA Bergstrom	Jun-09	NA	NA
116-DR-7 Inkwell Crib	100-DR	6-16-93	8 with 300 MHz antenna											verify location of crib		WHC-SD-EN-TI-179	Mitchell, TH and KA Bergstrom	Jan-94	83	No.
116-DR-8 Crib	100-DR	12-15-93	8 with 300 MHz antenna											locate edges of crib	10-15'	WHC-SD-EN-TI-225	Kunk, JA and Bergstrom, KA	Mar-94	65	No.
116-DR-9 Retention Basin	100-DR		System 10A with 200-MHz antenna	Geonics EM-31										verify locations of subsurface pipelines and utilities and any unknown features (e.g.,		BHI-00786	Bergstrom, KA; Mitchell, TH	May-96	40	Yes
132-DR-1 Waste Water Pumping Station	100-DR	12-29-93	8 with 300 MHz antenna											locate 132-DR-1 waste water pump station and associated piping	10-15'	WHC-SD-EN-TI-222	Bergstrom KA	Aug-96	41	Yes.
183-DR Sodium Dichromate	100-DR		GSSI SIR												None (1)		Mitchell, TH and KA	1999	NA	NA
MO-980 Trailer Site	100-DR		10A with 300 MHz antenna											locate subsurface utilities and other buried objects/debris	0-14'	None (1)	Mitchell, TH and KA Bergstrom	1988	NA	NA
100-F-1 Depression	100-F		10 with 300 MHz antenna	Geonics EM-31D										is a subsurface structure associated with the depression	10-18'	BHI-00343 Rev. 00	Bergstrom, KA, and TH Mitchell	Jul-95	35	No

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives Determining Whether There	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Bibliography				
			GPR	SIR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto				Ref. Numb	Abstract			
100-F-14 Vent Pipe	100-F		10 with 300 MHz antenna	GSSI SIR	Geoni cs EM-31D									is a subsurface structure beneath the vent pipe and map associated	10-18'	BHI-00343 Rev. 00	Bergstrom, KA, and TH Mitchell	Jul-95	35	No	
108-F Building	100-F														None (1)	WHC-SD-EN-TI-126	Mitchell, TH and KA	1999	NA	NA	
116-F-14	100-F	1-30-93	X											borehole siting	114	WHC-SD-EN-TI-114	Mitchell, TH, Kunk, and KA	May-93	78	No	
116-F-2	100-F	1-6-93	X											borehole siting							
116-F-3 Fuel Storage Basin Trench	100-F	1/12/93	GSSI SIR 8 with 300 MHz antenna	Geoni cs EM-31D										storage basin trench and identify subsurface obstructions within trench	0-15'	WHC-SD-EN-TI-118 (1). WHC-SA-2018/CONF-9310160-1 (2)	and Mitchell. 2) Bergstrom, KA; Mitchell, TH; Kunk, JR	1) Jul-93. 2) Jul-93	1) 13	1) No. 2) 12	Yes.
116-F-4 Pluto Crib	100-F	1/12/93, 1-22-93	8 with 300 MHz antenna	GSSI SIR	Geoni cs EM-31D									determine extent of pluto crib and locate subsurface obstructions	0-8'	WHC-SD-EN-TI-119	Bergstrom, KA, and TH Mitchell	Jun-93	10	No.	
116-F-5 Ball Washer Crib	100-F		10A with 300 MHz antenna											confirm location and map boundaries	0-12'	ERC IOM #051553	Bergstrom, KA, and TH Mitchell	1997	NA	NA	
116-F-6	100-F	1/6/93	X												115 (1). WHC-SD-EN-TI-247 (2)	WHC-SD-EN-TI-115 (1)	Bergstrom, KA, and TH Mitchell	93. 2) Sep-94	1) 5. 2) 90	1) No. 2) Yes.	
116-F-9D	100-F	3-17-93	X	GSSI SRI										borehole siting	129	WHC-SD-EN-TI-129	Bergstrom, KA, and TH Bergstrom	Jun-93	9	No	
199-F5-45	100-F	6-30-92	8 with 300 MHz antenna	GSSI SRI										underground utilities and subsurface debris that could be detrimental to future possible		204 (1). WHC-SA-2018/CONF-9310160-1 (2)	KA. 2) Bergstrom, KA; Mitchell, TH	1994. July 1993.	1) 31. 2) 12.	1) Yes. 2) Yes.	
199-F5-46	100-F	8-6-92	8 with 300 MHz antenna											underground utilities and subsurface debris that could be detrimental to		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
199-F5-47	100-F	6-30-92, 8-6-92	GSSI SRI 8 with 300 MHz antenna											underground utilities. Investigate the proposed drill site for subsurface anomalies tha would be		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
199-F5-48	100-F	6-30-92	GSSI SRI 8 with 300 MHz antenna											underground utilities. Investigate the proposed drill site for subsurface anomalies tha would be		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
PNL Parallel Pits	100-F		10 with 300 MHz antenna	Geoni cs EM-31D										Locate and map the pits, buried debris, and trenches	10-18'	BHI-00343 Rev. 00	Bergstrom, KA, and TH Mitchell	Jul-95	9	No	
100-H-5 Disposal Site	100-H		10A with 300 MHz antenna	GSSI SRI										locate and map trench and associated features		ERC IOM #051553	Mitchell, TH and KA Bergstrom	1997	NA	NA	
100-H-5 Sludge Trench	100-H		10A with 300 MHz antenna	Geoni cs EM-31D											ERC IOM #051553	Bergstrom, KA, and TH Mitchell	1997	NA	NA		

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstract?	
116-H-1 Liquid Waste Disposal Trench	100-H		GSSI SIR 10 with 100 & 300 MHz antenna											locate and accurately map location of inlet pipe, northern lobe of trench, unknown features, major concentrations of debris, pipelines, utilities, etc.,	12-15'	BHI-00715	Bergstrom, KA; Mitchell, TH	Apr-96	39	Yes
116-H-3	100-H	1-30-92	8 with 300 MHz antenna	R										buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
116-H-3 Dummy Decon French Drain	100-H		8 with 300 MHz antenna	R										locate french drain and subsurface utilities and buried debris		ERC IOM #051553	Mitchell, TH and KA Bergstrom	1992	NA	NA
116-H-3 French Drain	100-H		10A with 300 MHz antenna											Verify location of french drain.	14-16'	ERC IOM #051553	Mitchell, TH and KA Bergstrom	1997	NA	NA
118-H-1 Burial Ground	100-H	9-93	GSSI SIR 8 with 300 MHz antenna	Geonics EM-31D										trenches, pits, and buried debris within burial ground. Define extent of anomalous	10-14'	WHC-SD-EN-TI-207 (1). WHC-SD-EN-DP-069 (2)	KA, Mitchell, TH, and JP Kiesler 2) Bergstrom and	1) Mar-94 2) 1994	1) 24. 2) 30	1) No. 2) No.
118-H-2 Burial Ground	100-H	9-93	GSSI SIR 8 with 300 MHz antenna	Geonics EM-31D										estimate their size, determine thickness of overlying fill, and locate any additional debris	10-15'	WHC-SD-EN-TI-208 (1). WHC-SD-EN-DP-069 (2)	Bergstrom, TH Mitchell, and GJ Szwartz. 2) Bergstrom and	1) Mar-94 2) 1994	1) 23. 2) 30	1) No. 2) No.
118-H-3 Construction Burial Ground	100-H	9-93	GSSI SIR 8 with 300 MHz antenna	Geonics EM-31D										locate individual trenches, concentration of debris in trenches, determine thickness of overlying fill, and locate	10-15' ft	WHC-SD-EN-TI-209 (1). WHC-SD-EN-DP-069 (2)	1) KA Bergstrom, TH Mitchell, and GJ Szwartz. 2) Bergstrom and	1) Mar-94 2) 1994	1) 86. 2) 30	1) No. 2) No.
128-H-1 Burial Ground	100-H	12-93	8 with 300 MHz antenna	Geonics EM-31D										features in the 128-H-1 burn pit that may affect the emplacement of soil-	0-11	WHC-SD-EN-TI-217	Mitchell, TH and KA Bergstrom	#####	116	Yes.
130-H-1	100-H		X GSSI SIR									X		Locate and map underground fuel storage tanks, pipes, and	15 ft	PNL letter report to Mark Morton, WHC	G.A. Sandness	#####	NA	NA
199-H4-46	100-H	1-20-92	8 with 300 MHz antenna	R										buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-H4-47	100-H	1-19-92, 1-16-92	8 with 300 MHz antenna											buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-H4-48	100-H	1-24-92	8 with 100 and 300 MHz antenna	R										Locate utilities and buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-H4-49	100-H	1-20-92	8 with 300 MHz antenna											buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
199-H5-1	100-H	1-20-92	8 with 100 and 300 MHz antenna											Locate utilities and buried debris that may effect the drilling of a borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.

Review of Geophysical Characterization Methods

Appendix A- Catalog of Shallow Surface Geophysical Surveys

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	EM	IP	Downhole Acoustic	Seismic Resitivity	ERT	Gravity	Magnetics	Metal Detecto	Other						Ref. Numb	Abstract t?	
Proposed Flow Meter Boreholes	100-H		X										Site Borehole		WHC-SD-EN-11-263	Kiesler, Mitchell, TH	Dec-94	59	Yes.	
Sodium Dichromate Barrel Landfill	100-H		X	X											WHC-SD-EN-ES-30 (1). WHC-SA-2018-FP (2)	and KA Bergstrom, 2) Bergstrom,	1) Oct-92 2) Jul-93	1) 68. 2) 12	1) No. 2) Yes	
Thimble, south of 116-H-2	100-H	8/93	X	X									locate the buried thimble		WHC-SD-EN-11-210 (1). WHC-SD-EN-DP-069	Bergstrom, KA. 2) Bergstrom and Bergstrom	7/8/1994	1) 26. 2) 30	1) Yes. 2) No.	
116-K-2 Borehole	100-K		X										Site Borehole		WHC-SD-EN-11-092	PNL letter report to Ron Shuck, WHO	G.A. Sandness	Jan-93	3	No.
130-K-1,2	100-K		X									?	Locate and map underground fuel storage tanks, pipes,	15 ft	####	NA NA				
199-K-106A	100-K	12-16-	X										borehole siting		WHC-SD-EN-TI-204	Mitchell, TH	Jul-94	89	Yes.	
199-K-107A	100-K	12-16-	X										borehole siting		WHC-SD-EN-TI-204	Mitchell, TH	Nov-94	91	Yes.	
199-K-108A	100-K	93	XSSISRI										borehole siting		WHC-SD-EN-TI-228	Bergstrom KA, and Mitchell,	Feb-94	21	Yes.	
199-K-109A, 199-K-110A, and 199-K-111A boreholes	100-K	8 with 300 MHz antenna											locate subsurface obstructions that may affect the drilling		WHC-SD-EN-TI-253	Mitchell, TH	1995	94	Yes.	
199-K-32A&B	100-K	4-29-92; 4-27-92	GSSI SRI										Locate possible underground utilities. Investigate the proposed drill site for subsurface anomalies that would be		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
199-K-34	100-K	5-7-92	8 with 300 MHz antenna SRI										locate utilities and buried debris that may effect drilling of borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
199-K-35	100-K	5-7-92	8 with 300 MHz antenna SRI										locate utilities and buried debris that may effect drilling of borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
199-K-36	100-K	5-18-92	8 with 300 MHz antenna SRI										locate utilities and buried debris that may effect drilling of borehole		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.	
116-KE-1 Well Site	100-KE		10A with 300 MHz antenna SRI										map utilities, pipelines, and other subsurface features		ERC IOM #064927	Mitchell, TH and KA Bergstrom	1998	NA	NA	
116-KE-3 Well Site	100-KE		10A with 300 MHz antenna										map utilities, pipelines, and other subsurface features		ERC IOM #064927	Mitchell, TH and KA Bergstrom	1998	NA	NA	
120-KE-3 Filter Water Facility	100-KE		10A with 300 and 500 MHz antenna										locate and map extent of trench		BHL-00180	Bergstrom, KA; Mitchell, TH; Bolin, DJ	Apr-95	32	Yes	
130-KE-1A & B	100-KE		X									X	Locate and map underground fuel storage tanks, pipes,	15 ft	PNL letter report to Mark Morton, WHO	G.A. Sandness	#####	NA	NA	
116-KW-3A	100-KW	10-5-92											borehole siting		WHC-SD-EN-TI-095	Mitchell TH and KA	#####	74	No.	
116-KW-4A	100-KW	10-6-92											borehole siting		WHC-SD-EN-TI-093	Mitchell TH and KA	#####	73	No.	
130-KW-1A & B	100-KW		X									X	Locate and map underground fuel storage tanks, pipes,	15 ft	PNL letter report to Mark Morton, WHO	G.A. Sandness	#####	NA	NA	

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	CSSI SIR	EM	IP	Downhole Acoustic	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto					Ref. Numb	Abstract	
100-N-G5-1	100-N	7/24/92		8 with 300 -MHz antenna										Locate excavation for and underground tank that had been removed.		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	31	Yes.
100-N-LFT	100-N		X										X	Locate and map underground fuel storage tanks, pipes.	15 ft	PNL letter report to Ron Shuck, WHO	G.A. Sandness	#####	NA	NA
100-N-SS-27,28	100-N	11-20-92	X										X	Locate and map underground fuel storage tanks, pipes,	15 ft	WHC-SD-EN-TI-088	Bergstrom, KA and TH	Jan-93	7	No.
116-N-2	100-N	11-10-92	X											borehole siting		WHC-SD-EN-TI-090	Bergstrom, KA and TH	Jan-93	4	No.
119N	100-N	92	X											borehole siting		WHC-SD-EN-TI-089	Mitchell TH and Bergstrom,	Jan-93	71	No.
1322N	100-N	92	X											borehole siting		PNL letter report to Ron Shuck, WHO	G.A. Sandness	#####	NA	NA
182-N-DT-1,2,3	100-N		X	SSSI SIR									X	Locate and map underground fuel storage tanks, pipes,	15 ft	WHO	G.A. Sandness	#####	NA	NA
N-80	100-N	6-19-92		8 with 300 -MHz antenna										borehole siting		WHC-SD-EN-TI-204, Rev. O	Bergstrom, KA	1994	21	Yes.
South Pond	100-N	11-2-92	X											borehole siting		WHC-SD-EN-TI-094	Bergstrom, KA and TH	Jan-93	2	No.
UN-100N-17	100-N	11-2-92	X	SSSI SIR										borehole siting		WHC-SD-EN-TI-091	Mitchell TH and Bergstrom,	Jan-93	75	No.
1100-EM-1 South Pit	1100	thru 11-27-1990	8 with 300 -MHz antenna	Geonics EM-31										locate and map boundary of pit		WHC-MR-0243	Mitchell TH, and J Kunk	Feb-91	67	No.
Antifreeze and Degreaser Pit, Site 1100-3	1100		X	X									X	Determine pit boundaries and the distribution of buried waste materials.	20 ft	PNL Letter Report on Geophysical Surveys at Four Inactive Waste	G.A. Sandness, E.V. Allen, and D.K. Larson	May-89	NA	NA
Battery Acid Pit, Site 1100-1	1100												X	Locate pit and nearby pipes or cables	10 ft	PNL Letter Report on Geophysical Surveys at Four Inactive Waste	G.A. Sandness, E.V. Allen, and D.K. Larson	May-89	NA	NA
Horn Rapids Landfill	1100	1989	X	SSSI SIR	X								X	Determine pit boundaries and the distribution of buried waste materials.	20 FT	PNL Letter Report on Geophysical Surveys at Four Inactive Waste	G.A. Sandness, E.V. Allen, and D.K. Larson	May-89	NA	NA
Horn Rapids Landfill	1100	5-5 thru 5-12-1991	3 with 120-MHz antenna	Geonics EM-31									ics G856 gradiometer	Deliniate trench boundaries and locate areas containing 10 or more drums. Determine		WHC-SD-EN-TI-015	Clark, SW	Jul-92	45	No.
Old Hanford Bus Lot 000-1,2,3, Near highway between 200W and 200E	1100		X										X	Locate and map underground fuel storage tanks, pipes,	20 ft	PNL letter report to Robert Nielson, PNNL	G.A. Sandness	#####	NA	NA
located adjacent to the east side of the 200E Area	200-E		X										?	Locate and map underground fuel storage tanks, pipes.	15 ft	PNL letter report to Ron Shuck, ANO meter report	G.A. Sandness	#####	NA	NA
200-E Burial Ground	200-E		X											Locate distribution of water assumed to have leaked from cribs at the north and south	20 m	to Wade Chapman-Riggsbee, RHO PNL Memo to	G.A. Sandness	#####	NA	NA
														Reconnaissance to locate trenches	15 ft	Bob Kasper and C.S.	G.A. Sandness	#####	NA	NA

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography				
			GPR	SIR	EM	IP	Downhole	Seismic (Acousti)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other				Ref. Numb	Abstrac t?			
216-B-2-2 Ditch	200-E		10A with 200-MHz antenna	CSSI SIR 31	Geonics EM										support excavation permits and locate ditch		ERC IOM # 051520	Mitchell, TH and KA Bergstrom	1997, 1999	NA	NA	
216-B-3-1 Ditch	200-E		8 with 300 -MHz antenna	Geonics EM antenna R	31D										verify the staked location of the ditch	8-18 ft	WHD-SD-EN-TI-281	Bergstrom, KA	#####	27	Yes.	
216-B-3-3 Ditch	200-E		10A with 200-MHz antenna												support excavation permits for test pits and map edges of ditch		None (1)	Mitchell, TH and KA Bergstrom	1999	NA	NA	
216-C-1 Crib	200-E		X												Locate crib and related pipes.	15 ft	PNL Memo from T.J. McLaughlin	T.J. McLaughlin	#####	NA	NA	
9 test sites Air Duct at PUREX Building	200-E		X												Detectability of GPR to detect and map buried pipes and cables.	15 ft	PNL Memo to Roger Keck PNL Memo to W.E. Simpson	G.A. Sandness and C.S.	#####	NA	NA	
B Ditch	200-E		X	CSSI SIR	X										Detect possible voids Detect possible shallow water layer	20 ft		G. Sandness	1986	NA	NA	
B-Pond	200-E		10A with 200-MHz antenna	Geonics EM antenna R	31										Support excavation permits for test pits and one borehole and map original surface of pond		None (1)	Mitchell, TH and KA Bergstrom	1999	NA	NA	
Gable Mtn. Pond	200-E		10A with 200-MHz antenna	Geonics EM	31										permits for test pits and map original surface of pond		None (1)	Mitchell, TH and KA Bergstrom	1999	NA	NA	
Gable Mtn. Pond, North of 200-E	200-E							Soiltest R-60 D. C. Earth Resistivity Meter and		Worde n Gravit y Meter	Geometr ics G-816 Proton Precessi on				Delineate geologic controls for potential groundwater movement from Gable Mtn. Pond to the Rattlesnake Ridge Interbed.				1) BA Moore. 2) Strait, SR and Moore, BA	1) Sep-1982. 2) Dec-1982	1) 96. 2) 114	1) Yes. 2) Yes.
Hot Semiworks Proposed 120-acre site for shallow land grout disposal. East of PUREX	200-E		X												Map underground pipes and cables. Examine	16 ft	PNL letter report to Robert R.	G.A. Sandness	#####	NA	NA	
Proposed 5-acre tank farm site located just west of the A	200-E		X	X											Determine whether site contained buried manmade structures, objects or materials.		PNL letter report to Greg Campbell, RHO	G.A. Sandness	#####	NA	NA	
Proposed 70-acre site for shallow land grout disposal. Directly north of Hot Semi	200-E		X	X											possible buried waste deposits and underground pipes and	20 ft		G. Sandness	1984	NA	NA	
Proposed construction sites A & B near B	200-E		X	X											Determine whether site contained buried manmade structures, objects, or materials.		PNL letter report to Greg Campbell, RHO	G.A. Sandness	#####	NA	NA	
Proposed site for HWVP .25 mi WSW of B Plant	200-E		X	X											Detect and map any buried waste deposits, pipelines, or cables.	20 ft	PNL letter report to Claude Denson, KEH	G.A. Sandness	#####	NA	NA	
															Detect and map any buried waste deposits, pipelines, or cables.	15 ft	PNL letter report to Jack Cloud, KEH	G.A. Sandness	#####	NA	NA	

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstract?	
Tank Mockup Test Site Near Hot Semi Works	200-E								X					1) test the capabilities and limitations of ERT to determine its utility to detect and map leaks from underground storage tanks during waste removal processes, and for long term vadose zone monitoring. 2) develop and demonstrate the		WHC-SD-EN-TP-057 (1). WHC-SA-3035-FP/CONF-960477-3 (2).	1) Narbutovskih, SM. 2) Narbutovskih, SM., et. al.	1) Apr-96. 2) Jan-96	101.	1) 97. 2) Yes. 2) Yes.
TK-SQ-151, 152; B-Plant Vicinity of Tank	200-E	X										?		Locate and map underground fuel storage tanks, pipes. Investigate effectiveness	15 ft	PNL letter report to Ron Shuck, WHO	G.A. Sandness	# ##### 1) 16-	NA	NA
101-A in the 241-A Tank Farm	200-E	X												of GPR to detect and map buried pipelines in	15 ft	PNL Memos to Bill Jordan	Sandness and C.S. Kimball	Dec-81 2) 18-	1) NA 2) NA	1) NA 2) NA
216-U-1/2 pipeline	200-W	X												Locate and determine the depth of the 216-U-		WHC-SD-EN-TI-262	Fassett, J., Bergstrom, KA	##### 52	Yes.	
216-U-4 and 216-U-16	200-W	X												Locate the vitrified clay pipe, locate bends in the pipe, and locate possible utilities or other		WHC-SD-EN-TI-176	Bergstrom and Mitchell	##### 16	No.	
216-U-8 and -U-12 transfer line	200-W	X	X											TSV site. Detect underground objects or	20 ft	PNL Memo to Jim Buelt, PNL	Bergstrom, KA	##### 28	Yes.	
216-Z-12 Crib	200-W	X					Vertical Seismic Profiling and Reverse d VSP, using jet perforator as source and DAS							test techniques for obtaining velocity control and subsurface imaging capabilities		WHC-SA-2304/CONF-940353-4	Narbutovskih, SM; Michelsen, F	Feb-94	98	Yes
216-Z-1A, -9, & -18 (CCI4 site)	200-W			Frequency Domain (FDEM),	X	Refractio n, Reflectio n, 2-D High	Direct Current (DC)							Support demonstration of a data fusion workstation		WHC-SD-EN-TI-202 (1). WHC-SD-EN-AP-116 (2). DOE/MC/29106-2531 (3). PNL Informal Report	1) Rohay, V.J., et. al. 2) Clayton, EA. 3) Hoekstra, P; Vandergraft, J; Blohm, M;	9/28/1993 1) 3. 2) 1993. 3) 2) 46. 3) 55. 4) Sep-47.	109. 2) No. 3) YES. 4) YES.	
216-Z-1A, -9, & -18 (CCI4 site)	200-W	X				Resolution on Reflection using new amplitude versus								determine location and distribution of DNAPL		on Non-Invasive Determination of the Location and Distribution of Free-Phase Dense Nonaqueous	M. G. Waddell, W. J. Domoracki, TJ Temples, and J Eyer	Nov. 1999	NA	NA
216-Z-9 Trench / CCI4 site	200-W	Jan-99													WHC-SD-EN-TI-295	Kiesler	Aug-96	61	No.	
218-W-3A, -4B, and -4C	200-W																			

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography			
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstract?		
218-W-4C Trench #4	200-W		X with 300 MHz antenna	X										determine outer edges of trench, select locations for plate-bearing tests, differentiate between different types of waste		WHC-SD-EN-TI-285	Kiesler, Kiesler,	1994	60	Yes	
Trenches #1 and #4	200-W													determine effectiveness of GPR for defining the depth and location of		WHC-SD-EN-TI-174	Bergstrom and Mitchell	1993	58	Yes	
221-U Plant Cut	200-	X														WHC-SD-EN-TI-	Kiesler and	Aug-93	57	No.	
221-T Building SQ Tanks	200-W	4/4/94	8 with 300- and 500-MHz antenna	SIR										obstructions that may affect the removal of tanks and supporting structures		WHC-SD-EN-TI-223	Mitchell, TH; Bergstrom, KA;	1995	95	Yes.	
221-U Plant (south side of building)	200-W		10A with 300-MHz antenna	SIR										subsurface tanks, utilities, pipelines, and unknown buried features	0-14'	BHI-01182	Mitchell, TH; Sharpe, JJ; Singleton, KM	#####	43	Yes	
221-U southwest corner and MO-722	200-W		10A with 300-MHz antenna											locate subsurface utilities, pipelines, and other buried features	0-14'	None (1)	Mitchell TH, and KA				
299-W11-232 Borehole	200-W		X											site boreholes		WHC-SD-EN-TI-141	Mitchell and Bergstrom	1998	NA	NA	
299-W15-218 Borehole	200-W		X											site boreholes		WHC-SD-EN-TI-096	Bergstrom and Mitchell	Jan-94	84	No.	
299-W15-219, W15-220, W18-252 Boreholes	200-W		X											site boreholes		WHC-SD-EN-TI-153	Bergstrom and Mitchell	Jan-93	6	No.	
299-W15-25 and W15-223	200-W		X	SIR										site boreholes		WHC-SD-EN-TI-196	Bergstrom and Bergstrom	Jun-93	11	No.	
299-W15-25, 26 and 27 Boreholes	200-W	6-14-93, 5-5-94	8 with 300 MHz antenna	SIR										locate subsurface obstructions that may affect the drilling		WHC-SD-EN-TI-282	Mitchell, TH	Jan-95	92	Yes.	
cone penetrometer site, CPT-4, candidate ISV	200-W	5-12-93	8 with 300 MHz antenna											obstructions that may affect cone penetrometer work		WHC-SD-EN-TI-162	PNL Memo to	Mitchell, TH	1993	82	Yes
test site adjacent to west side of CPT-BT-23 borehole	200-W		X											Locate assumed backfilled trench.	14 ft	PNL Memo to Craig Timmerman, PNL	G.A. Sandness	#####	NA	NA	
REDOX Bldg	200-W		X											site boreholes		WHC-SD-EN-TI-193	Mitchell and Bergstrom	Mar-94	76	No	
300 Area Burial Grounds (300 North)	300		Prototype system with 1000 MHz antenna, and a				3-D Holographic imaging (test site only)				Proton Precision and cesium vapor magneto	2 commercial systems		Locate, map, and define buried waste. Locate and define the gross composition of waste materials.		PNL-2557	Phillips, SJ; Aims, LL; Fitzner, RE; Gee, GW; Sandness, GA; and Simmons,	1980	106	Yes	
300 Area Process Sewers and radioactive liquid waste sewers	300		GSSI SIR System 7 with 300-MHz antenna	Geonics EM-31										Confirm the locations of the sewers as shown on existing maps or to otherwise accurately determine their		EMO-1032	Sandness, GA	Mar-91	110	Yes	

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography	
			GPR	EM	IP	Downhole Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other						Ref. Numb	Abstract?
300-FF-5	300	1991				Reflection							Two main targets: the water table at roughly 40 ft, and the Ringold Lower mud at about 180 ft.		WHC-SD-EN-TI-069 (1) WHC-SD-EN-DP-059 (2). WHC-SD-EN-TI-120 (3)	1) Kunk, J. R., S. M. Narbutovskih, K. A. Bergstrom, and	1) Jan-93. 2) 1993. 3) Jul-1993	1) 63. 2) 64. 3) 97	1) No. 2) no. 3) yes.
307 Process Trench	300		GSSI SIR System 7 with 100-, 120-, and 300-MHz	Geonics EM-31									detect underground pipes, cables, or other subsurface features, and to locate the boundaries of the trench		WHC-SD-EN-TI-062	Sandness, GA	Nov-91	112	No
307 Retention Basin	300		GSSI SIR System 7 with 120- and 500-MHz										detect underground pipes, cables, or other subsurface features		WHC-SD-EN-TI-062	Sandness, GA	Nov-91	112	No
311-1,2	300		X GSSLSIR								X		Locate and map underground fuel storage tanks, pipes and	PNL letter report to Ron Shuck, WHO	G.A. Sandness	#####	NA	NA	
316-4 (300 North Crib)	300		10 with 300 MHz antenna	Geonics EM-31D									determine depth of burial, map associated plumbing for tanks and	10-18' BHI-00212 PNL letter report to Mark Morton, WHO	Bergstrom KA; Mitchell TH; Bolin BJ	May-95	34	No	
325-1	300		X								X		Locate and map underground fuel storage tanks, pipes,	15 ft	G.A. Sandness	#####	NA	NA	
384 Powerhouse Fuel Oil Day Tanks	300		10A with 300 and 400-MHz antenna	R									map utilities, pipelines, and other subsurface features		Mitchell, TH and KA Bergstrom	1998, 1999	NA	NA	
384 Powerhouse USTs	300		10A with 300 MHz antenna	R									map utilities, pipelines, and other subsurface features	0-12' None (1)	Mitchell, TH and KA Bergstrom	1998, 1999	NA	NA	
618-1 Burial Ground	300		10A with 300 MHz antenna										map subsurface pits, trenches, buried debris, etc. within landfill		Mitchell, TH and KA Bergstrom	1995	NA	NA	
618-10 and 618-11 (300 Area North and Wye	300		X			Reflection & Refraction				X	X		geophysical exploration		BNWL-SA-5494 / CONF-750967-15	Phillips, SJ; Raymond, JR	1975	103	Yes
618-10 and 618-11 (300 Area North and Wye Burial Grounds)	300		Corp. with 1000 MHz antenna			Reflection & Refraction			X	X	cadmium-telluride infrared detector	composition, size, distribution, and depth of buried objects and characterizing the		BNWL-SA-54941 / CONF-750967-16	Phillips, SJ; Raymond, JR	1975	104	Yes	
11 (300 Area North and Wye Burial Grounds)	300		X			X			X	X		Evaluate a variety of site characterization methods	20 ft BNWL-2184	Reisenauer, AE; Rickard, WH, and	1977	105	No.		
618-10 Burial Ground	300		System 8 (4800) with 300-MHz	Geonics EM-31D								individual trenches, locate highest concentrations of debris, determine thickness of	10-18' BHI-00291-REV.1	Bergstrom, KA; Bolin, DJ; Mitchell, TH	Sep-97	42	Yes		
618-11 Burial Ground	300		GSSI SRI System 10 with 300-MHz antenna	Geonics EM-31D								Delineate boundaries of individual trenches, locate highest concentrations of debris, determine thickness of	10-18' BHI-00291-REV.1	Bergstrom, KA; Bolin, DJ; Mitchell, TH	Sep-97	42	Yes		

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	SIR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto					Ref. Numb	Abstract?	
618-13 Mound	300		10 with 300 MHz antenna	Geonics EM-31D										Locate possible drums or other detectable waste	10-18'	BHI-00212	Bergstrom KA; Mitchell TH; Bolin BJ	May-95	34	No
618-2 Burial Ground	300		GSSI SIR												BHI-00297, Rev. 1	Mitchell, TH and KA	1995	NA	NA	
618-3 Burial Ground	300		10A with 300 MHz antenna	Geonics EM-31D										map subsurface pits, trenches, buried debris, etc. within landfill	BHI-00297, Rev. 1	Mitchell, TH and KA Bergstrom	1995	NA	NA	
618-4 Burial Ground	300		System 7 with 300-MHz antenna	Geonics EM-32										and pits, determine the depth of fill, and locate waste materials, including any that might	EMO-1032	Sandness, GA	Mar-91	110	Yes	
618-4 Burial Ground	300		GSSI SIR System 7 with 120-MHz antenna									Geometrics G-856 Proton Precessi	Fisher TW6	determine depths of fill, identify subsurface structures such as trenches and pits, and detect and map buried	WHC-SD-EN-TI-061	Sandness, GA	Sep-91	111	No	
618-4 Burial Ground	300		Electrical Offset Logging (EOL); surface to borehole electr											delineate depth and lateral extent of conductive zones	PNNL Letter Report (1). Client Report for Battelle Pacific Northwest "618-4 Burial Ground" (2).	2) Murray, Last, Chien, and Sandness 1) WMI International, Inc. 1) 9/16/99 2) 8/1/1999	1) NA 2) NA	1) NA 2) NA		
618-4 Burial Ground	300		LEMA, GSSI SIR 10A with 300-MHz antenna									Also tested RAMAC GPR with 200-, 400-MHz, and 1 GHz antenna, and the GSSI	PNL-SA-25908 (1). Draft Technology Evaluation Report (RL 37SS41) (2) None ⁽¹⁾ (3) ⁽²⁾	1) Collins, Gribble, Hall, and Lechelt. 2) Collins, DH. 3) Mitchell, TH and KA	1) Apr-1995. 2) Sep-1997. 3) NA	1) 48. 2) NA 3) NA	1) Yes. 2) No 3) NA			
618-5 Burial Ground	300		GSSI SIR System 7 with 120-MHz antenna									Geometrics G-856 Proton Precessi	Fisher TW6	determine depths of fill, identify subsurface structures such as trenches and pits, and detect and map buried	WHC-SD-EN-TI-061	Sandness, GA	Sep-91	111	No	
618-5 Burial Ground Perimeter	300		System 7 with 300-MHz antenna	Geonics EM-31										and pits, determine the depth of fill, and locate waste materials, including any that might delineate the boundaries of individual trenches, locate the highest concentrations of debris within the trenches, determine the thickness of the fill overlying the	EMO-1032	Sandness, GA	Mar-91	110	Yes	
618-7 Burial Ground	300		GSSI SIR 10 with 300 MHz antenna	Geonics EM-31D											10-18'	BHI-00313	Bergstrom, KA, TH Mitchell, and BJ Bolin	May-95	33	No

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Date	Bibliography		
			GPR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto	Other					Ref. Numb	Abstract?	
618-8 Burial Ground	300		GSSI SIR 7 with 50-200 MHz antenna	X							Varian VIW-2302A1	Cesium Vapor	Fisher TW5	locate buried waste material and determine boundaries of waste trenches or pits.	15 ft	PNL Letter Report #0002745, to Mary Sinclair	Sandness, GA	#####	NA	NA
618-8 Burial Ground	300		GSSI SIR 10 with 300 MHz antenna	Geonics EM-31D										ground, locate other trenches, pits, etc., and locate concentrations of buried debris and	10-18	BHI-00212	Bergstrom KA; Mitchell TH; Bolin BJ	May-95	34	No
618-9 Burial Ground Area	300		8 with 300 MHz antenna											trench and map boundaries. Map anomalies in trench.		WHC-MR-0271	JR Kunk and Th Mitchell	Jul-91	62	No
outside fenced burial ground approximately .5	300		GSSI SIR											Check whether burial trench extended outside	15 ft	PNL letter report to Cliff Meinhardt, RHO	G.A. Sandness	#####	NA	NA
Burial Trench West of Process Trenches	300		10 with 300 MHz antenna	Geonics EM-31D										determine if solid waste was buried in the berm and map concentrations of waste if present	10-18	BHI-00212	Bergstrom KA; Mitchell TH; Bolin BJ	May-95	34	No
aluminate rods; approx. 1000 ft north of 300 Area, east of Process	300		X											Locate lithium aluminate rods buried in undocumented location.	16 ft	PNL letter report to Doug Lenkersdorfer, WHC	G.A. Sandness	#####	NA	NA
TSV Test Site NW of 300 Area	300		X	X							X	X		Detect any manmade objects or materials.	20 ft	PNL Memo to Craig	G.A. Sandness	#####	NA	NA
TSV Test Site NW of 300 Area	300		X	X							X	X		Detect any manmade objects or materials.	20 ft	PNL Memo to Steve Liikala	G.A. Sandness	#####	NA	NA
Landfill 1A	300		GSSI SIR System 7 with 120- and 300-MHz	Geonics EM-31							Geometrics G-856	Proton Precessi	Fisher TW6	determine depths of fill, identify subsurface structures such as trenches and pits, and detect and map buried		WHC-SD-EN-TI-060	Sandness, GA	Apr-92	113	No.
Landfill 1B	300														ERC IMO #053474	Bergstrom, KA, and TH	1998	NA	NA	
Landfill 1B	300		GSSI SIR System 7 with 120- and 300-MHz	Geonics EM-31							Geometrics G-856	Proton Precessi	Fisher TW6	determine depths of fill, identify subsurface structures such as trenches and pits, and detect and map buried		WHC-SD-EN-TI-060	Sandness, GA	Apr-92	113	No.
Landfill 1C	300		GSSI SIR System 7 with 120- and 300-MHz	Geonics EM-31							Geometrics G-856	Proton Precessi	Fisher TW6	determine depths of fill, identify subsurface structures such as trenches and pits, and detect and map buried		WHC-SD-EN-TI-060	Sandness, GA	Apr-92	113	No.
Landfill 1D Burn Pit	300		GSSI SIR System 7 with 120- and 300-MHz	Geonics EM-31							Geometrics G-856	Proton Precessi	Fisher TW6	determine depths of fill, identify subsurface structures such as trenches and pits, and detect and map buried		WHC-SD-EN-TI-060	Sandness, GA	Apr-92	113	No.
Planned pipeline; North of 300 Area	300		X	GSSI SIR										Determine if Indian graves or other artifacts	10 ft	PNL memo	G. Sandness	1992	NA	NA
Burial Ground (Early Burial Ground)	300		10 with 300 MHz antenna	Geonics EM-31D										General reconnaissance to locate concentrations of buried waste	10-18	BHI-00212	Bergstrom KA; Mitchell TH; Bolin BJ	May-95	34	No

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Depth (ft)	Reference (Doc. No.)	Author(s)	Bibliography				
			GPR	CSSI SIR	EM	IP	Downhole	Seismic (Acoustic)	Resistivity	ERT	Gravity	Magnetics	Metal Detecto				Ref. Numb	Abstract?			
Undocumented Solid Waste Burial Ground	300		10 with 300 MHz antenna	Geonics EM-31D										site and locate possible trenches, pits, and high concentrations of debris	10-18	BHI-00212	Bergstrom KA; Mitchell TH; Bolin BJ	May-95	34	No	
Fire Station	300		X										?	Locate and map underground fuel storage tanks, pipes.	15 ft		G. Sandness	1992	NA	NA	
3000-1,2,3,4, 12 underground fuel storage tanks	3000		X										X	Determine location, depth, orientation, and size of each tank. Also map pipes and cables.	15 ft	PNL letter report to Mark Morton, WHO	G. Sandness	#####	NA	NA	
3000-5,6	3000		X										X	Locate and map underground fuel storage tanks, pipes.	15 ft	PNL letter report to Ron Shuck, WHO	G. Sandness	#####	NA	NA	
3000-8,9,10,11	3000		X										X	Locate and map underground fuel storage tanks, pipes.	15 ft	PNL letter report to Ron Shuck, WHO	G. Sandness	#####	NA	NA	
622-R Weather Station	600		X										X	Locate and map underground fuel storage tanks, pipes.	15 ft	PNL letter report to Ron Shuck, WHO	G. Sandness	#####	NA	NA	
6652 L & P; ALE	600		X										X	Locate and map underground fuel storage tanks, pipes.	15 ft	PNL letter report to Mark Morton, WHO	G. Sandness	#####	NA	NA	
Goose Egg Hill Area	600		GSSI SIR 8 with 300-MHz antenna	Geonics EM-31										Detect and map clastic dikes		BHI-01103	Bjornstad, DG Horton, GV Last, SP Reidel and KA	Jul-99	53	Yes	
H-06-H Military Landfill, Wahluke Slope	600	7-27 thru 8-4 92	Geonics EM-31DL										Magnetic gradiometer	locate and determine the extent of waste site at 2 areas		WHC-SD-EN-ER-001	Gustafuson F. W.	Dec-92	54	No	
H-83-L Military Landfill, Wahluke Slope	600	7-27 thru 8-4 92	Geonics EM-31DL										Magnetic gradiometer	locate and determine the extent of waste site		WHC-SD-EN-ER-001	Gustafuson F. W.	Dec-92	54	No	
Hanford Townsite	600						X							Detect buried stream	NA	WHC-SD-EN-TI-116 (1). WHC-SA-2018/CONF-9310160-1 (2). WHC-SD-EN-DP-064 (3)	Quenton T) Mitchell, T. H., K. A. Bergstrom, and D. J. Hoff. 2) Bergstrom, KA; Mitchell, 3) May-93	?	NA	NA	
Non-Radioactive Dangerous Waste Landfill	600		X											Locate 20 trenches, determine thickness of overlying fill and locate primary concentrations of waste		1) Jun-93 2) Jul-93. 3) May-93	1) 79. 2) 12. 3) 85	1) No. 2) Yes. 3) No.			
North Slope	600		X												WHC-SD-EN-TI-124	Bergstrom and Mitchell	Jul-93	14	No.		
PSN-04 Military Landfill, Wahluke Slope	600	7-27 thru 8-4 92	Geonics EM-31DL										Magnetic gradiometer	locate and determine the extent of waste site at 4 areas		WHC-SD-EN-ER-001	Gustafuson F. W.	Dec-92	54	No	
Riverland Anti-Aircraft Artillery Site	600		GSSI SIR 8 with 300 MHz antenna											Determine if anything was buried in three mysterious dirt mounds		WHC-SD-EN-TI-117 (1). WHC-SD-EN-DP-061 (2). WHC-SA-2018/CONF-9310160-1 (3)	1) Bergstrom and Mitchell. 2) Bergstrom and Mitchell. 3) Bergstrom, KA, Mitchell, TH	1) Apr-1993. 2) Jul-1993	1) 8 2) 1 3) 12	1) No 2) No 3) Yes	
Railroad Maintenance Shop	600		8 with 300 MHz antenna	EM-31										maintenance pits and determine if 12,000 gal. UST had been removed		WHC-SD-EN-TI-117 (1) WHC-SD-EN-DP-061 (2)	KA and Mitchell. 2) Bergstrom and	1) Apr-93 2) 1992	1) 8 2) 1	1) No. 2) No.	

Site / Location	Area	Date(s) of Survey	Geophysical Methods Used										Survey Objectives	Max. Dept h (ft)	Reference (Doc. No.)	Author(s)	Bibliography				
			GPR	SIR	EM	IP	Downhole	Seismic (Acousti)	Resistivity	ERT	Gravity	Magnetics	Metal Detector	Other			Ref. Numb	Abstrac t?			
White Bluffs Crib, White Bluffs Townsite	600		10 with 500 MHz antenna	Geoni cs EM- 31DL									h 810 Utility/Pipe		Locate pipes relating to two cribs and analyze distribution network within cribs		WHC-SD-EN-ER- 002	Washington Hanford Company (WHC)	Apr-92	118	No.
703-1	700		GSSI SIR										X		Locate and map underground fuel storage tanks, pipes,	15 ft	PNL letter report to Ron Shuck, WHO	G. Sandness	#####	NA	NA
Hanford Site General	NA		8 and 10 with 300 MHz												Interpretation of Ground Penetrating Radar data		WHC-SA-2018, CONF-9310160-1	Bergstrom, KA; Mitchell, TH; Kunk, JR	Jul-93	12	Yes
Hanford Site General	NA							High- Resoluti on							Shallow High Resolution Seismic Reflection Technique		WHC-SD-EN-TI- 120	Narbutovskih, SM	#####	97	Yes

(1) Personal Communication with Tom Mitchell and Kevin Bergstrom (12-9-99). In WIDS.

Note: Unhighlighted entries are in the WIDS data base.

NA = Not Available or Not Applicable